Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1. A switched-current power converter comprising
a quantity m (where m is a positive integer) of constant current sources,
a quantity m of switching means, and
an output capacitor having a first terminal and a second terminal,
the second terminal of the output capacitor being connected to return,
the m constant current sources each having a current input that is connected to return,
the m constant current sources each having a current output,
the m constant current sources having equal currents,
the m switching means each having a switch input that is connected to the current output of one of the m constant current sources,
the m switching means each having a first switch output that is connected to return,
the m switching means each having a second switch output that is connected to the first terminal of the output capacitor,
the m switching means each having a first switch state in

which the current from the one of the m constant current sources to which it is connected is switched to return, and

the m switching means each having a second switch state in which the current from the one of the m constant current sources to which it is connected is switched to the output capacitor.

[c2] 2. The switched-current power converter of claim 1 wherein the m constant current sources are m buck converter circuits configured for constant current outputs.

[c3] 3. The switched-current power converter of claim 2 wherein the m buck converter circuits further comprises m hysteretic control means to maintain the current outputs at a constant value.

[c4] 4. The switched-current power converter of claim 2 wherein the m buck converters further comprise m current mode control means having fixed current references to maintain the current outputs at a constant value.

[c5] 5. The switched-current power converter of claim 1 wherein the m constant current sources are m elements of a matrix transformer, and

wherein a power source for the excitation of the matrix transformer is an input constant current source.

[c6] 6. The switched-current power converter of claim 5 wherein the input constant current source is a buck converter circuit having a hysteretic control means.

[c7] 7. The switched-current power converter of claim 5 wherein the input constant current source is a buck converter circuit having a current mode control means with a fixed current reference.

[c8] 8 The switched-current power converter of claim 5 further comprising a quantity m of bead inductors, each of the m bead inductors being on the switch input of one of the m switching means.

[c9] 9. The switched-current power converter of claim 1 further comprising an output voltage control means for operating the m switching means in response of the state of a voltage on the output capacitor.

[c10] 10. The switched-current power converter of claim 9 wherein the voltage control means comprises a first comparator means responsive to an over voltage state of the voltage on the output capacitor, and
a second comparator means responsive to an under voltage state of the voltage on the output capacitor.

[c11] 11. The switched-current power converter of claim 10

further comprising an up-down counter means and
a quantity m of switch driver means,
each of the m switch driver means being connected to one of the switching means for controlling the state of the m switching means,
the m switch driver means being responsive to a count of the up-down counter,
the up-down counter means being responsive to the first and second comparator means
such that if there is an under voltage condition of the voltage on the output capacitor, the count of the up-down counter means will increase and more of the m switching means will be in the second switch state, and if there is an over voltage condition of the voltage on the output capacitor, the count of the up-down counter means will decrease and fewer of the switching means will be in the second switch state.

[c12] 12. The switched-current power converter of claim 9 wherein the voltage control means comprises a first voltage reference and a resistor divider network connected to the first voltage reference so as to establish a quantity m of comparator reference voltages,
a quantity m of comparator means,
each of the m comparator means being responsive to the voltage on the output capacitor and to one of the m

comparator reference voltages,
each of the m comparator means being connected to one of the m switching means and operating the one of the m switching means such that
if the voltage on the output capacitor is higher than any one of the m comparator reference voltages to which the any one of the m comparator means is responsive, then the switching means to which the any one of the m comparators is connected will be in the first switch state, and
if the voltage on the output capacitor is lower than any one of the m comparator reference voltages to which any one of the m comparator means is responsive, then the switching means to which the any one of the m comparator means is connected will be in the second switch state.

[c13] 13. The switched-current power converter of claim 12 further comprising a quantity m of hysteresis feedback resistors, one for each of the m comparator means, so that each of the m comparator means has hysteresis.

[c14] 14, The switched-current power converter of claim 13 further comprising a voltage stabilization circuit responsive to a second reference voltage and the voltage on the output capacitor,
the voltage stabilization being connected to the resistor divider network to adjust the m comparator reference

voltages so as to maintain the voltage on the output capacitor at a correct voltage.

[c15] 15. A switched-current power converter comprising
a quantity m (where m is a positive integer) of constant current sources ,
a quantity m of switching means, and
an output capacitor having a first terminal and a second terminal,
the second terminal of the output capacitor being connected to return,
the m constant current sources each having a current input that is connected to return,
the m constant current sources each having a current output,
the m constant current sources having equal currents,
the m switching means each having a switch input that is connected to the current output of one of the m constant current sources,
the m switching means each having a switch output that is connected to the first terminal of the output capacitor,
the m switching means each having a first switch state in which the switching means is an open circuit,
the m switching means each having a second switch state in which the current from the one of the m constant current sources to which it is connected is switched

to the output capacitor,
the m constant current means each having an internal switching means,
the internal switching means each having a first internal switch state in which the current output of the constant current means is internally short circuited, and
the internal switching means each having a second internal switch state in which the current output of the constant current means is not short circuited.

[c16] 16. The switched-current power converter of claim 15 wherein the m constant current sources are m elements of a matrix transformer,
each of the m elements of the matrix transformer having first and second synchronous rectifier switching means, and wherein the first internal switch state is accomplished by closing both the first and the second synchronous rectifier switching means.